Networking Research at Uni Vienna
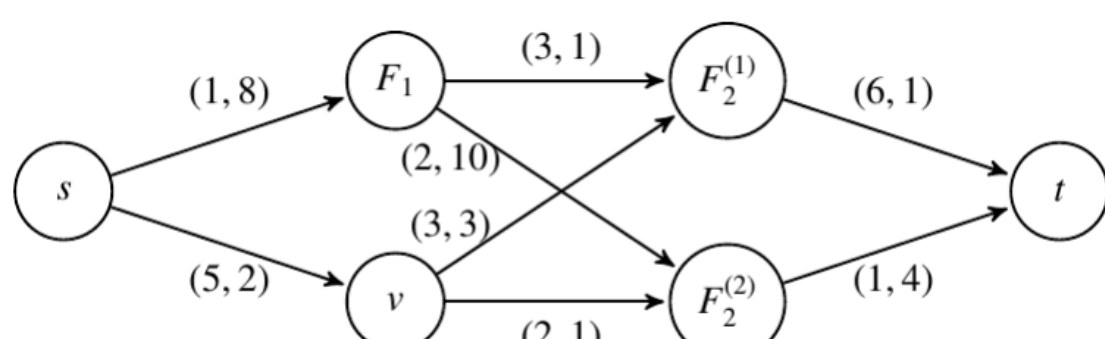
Stefan Schmid

Vision and Mission

Networked systems should become self-* (i.e., self-configuring, self-adjusting, self-optimizing). In particular: automated and data-driven approaches to design, optimize, and verify networked systems.
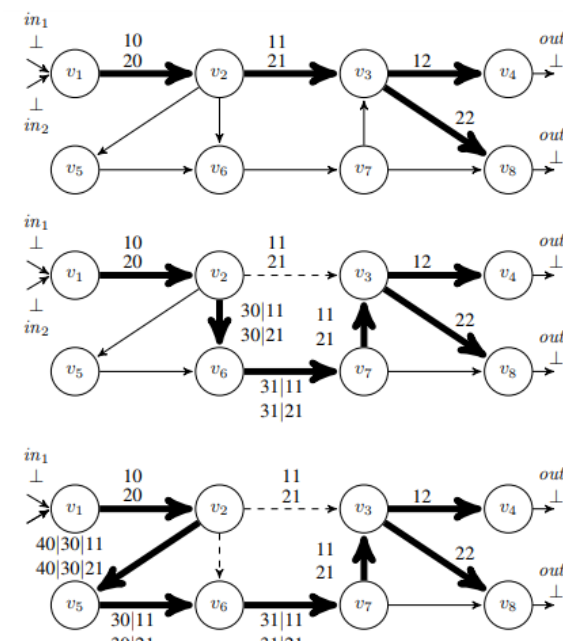
Quantitative and Polynomial-Time Network Verification

WNetKAT: Quantitative NetKAT for Performance and QoS

The Case for Weighted NetKAT!

### Fast What-If Analysis for MPLS and SR: An Automata-Theoretic Approach
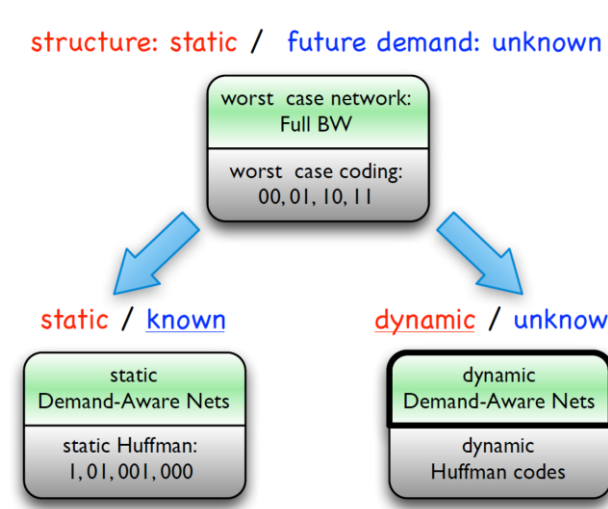

Further Reading

Polynomial-Time What-If Analysis for Prefix-Manipulating MPLS Networks Stefan Schmid and Jiri Srba. IEEE **INFOCOM** 2018.

P-Rex: Fast Verification of MPLS Networks with Multiple Link Failures Jesper Stenbjerg Jensen, Troels Beck Krogh, Jonas Sand Madsen, Stefan Schmid, Jiri Srba, and Marc Tom Thorgersen. ACM **CoNEXT** 2018.

WNetKAT: A Weighted SDN Programming and Verification Language Kim G. Larsen, Stefan Schmid, and Bingtian Xue. **OPODIS** 2016.

## Demand-Aware and Self-Adjusting Networks

DAN
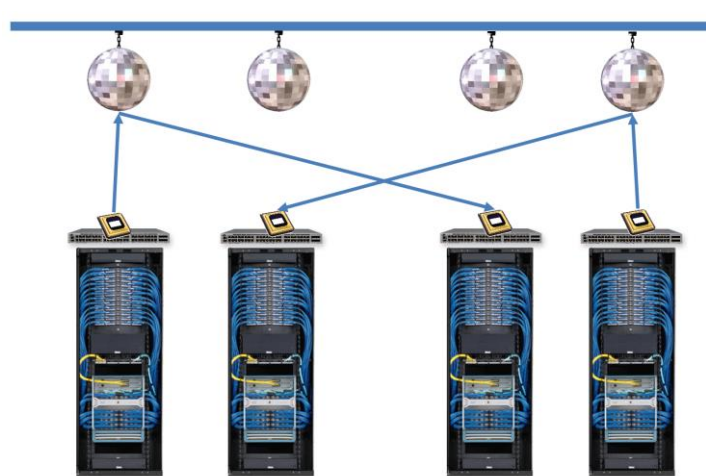
SAN

Further Reading

SplayNet: Towards Locally Self-Adjusting Networks Stefan Schmid, Chen Avin, Christian Scheideler, Michael Borokhovich, Bernhard Haeupler, and Zvi Lotker. IEEE/ACM Transactions on Networking (**TON**), 2016.

Demand-Aware Network Designs of Bounded Degree Chen Avin, Kaushik Mondal, and Stefan Schmid. **DISC** 2017.

Toward Demand-Aware Networking: A Theory for Self-Adjusting Networks Chen Avin and Stefan Schmid. ArXiv Technical Report, July 2018.

Characterizing the Algorithmic Complexity of Reconfigurable Data Center Architectures Klaus-Tycho Foerster, Monia Ghobadi, and Stefan Schmid. ACM/IEEE **ANCS** 2018.

Secure Network Virtualization and Fuzzing

Exploiting OVS and Packet Parser
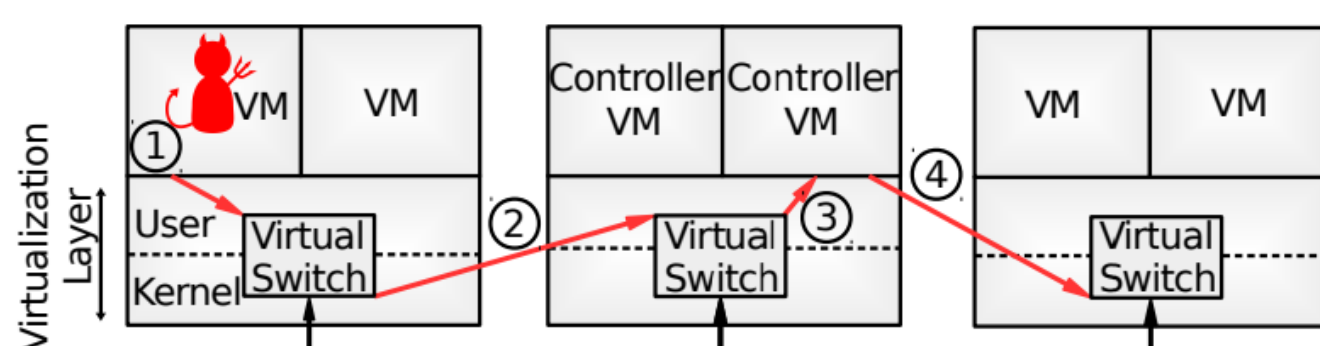
### Algorithmic Complexity / OVS Policy Injection Attacks
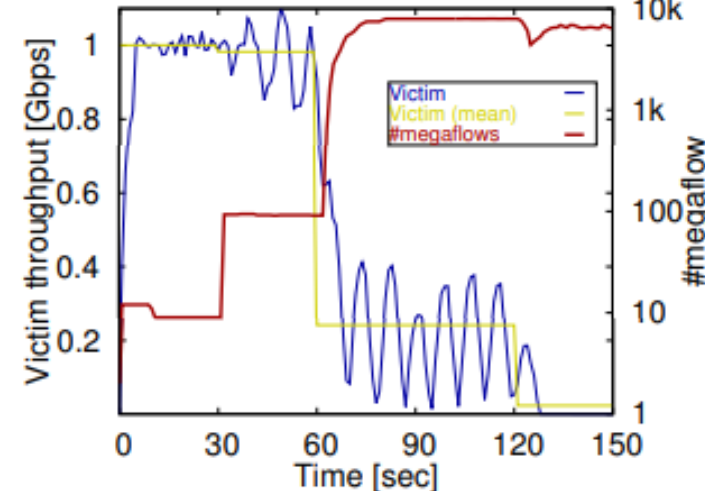
Further Reading

The vAMP Attack: Taking Control of Cloud Systems via the Unified Packet Parser Thimmaraju et al. **CCSW**, 2017.

Taking Control of SDN-based Cloud Systems via the Data Plane ACM **SOSR** 2018. Best Paper Award.

Virtual Network Isolation: Are We There Yet? Kashyap Thimmaraju, Gabor Retvari, and Stefan Schmid. ACM SIGCOMM 2018 **SecSon** 2018.

Policy Injection: A Cloud Dataplane DoS Attack Levente Csikor, Christian Rothenberg, Dimitrios P. Pezaros, Stefan Schmid, Laszlo Toka, and Gabor Retvari. ACM SIGCOMM 2018 Demo Paper, 2018.

Distributed Control Plane and Self-Stabilization

Consistent Transactional Network Updates
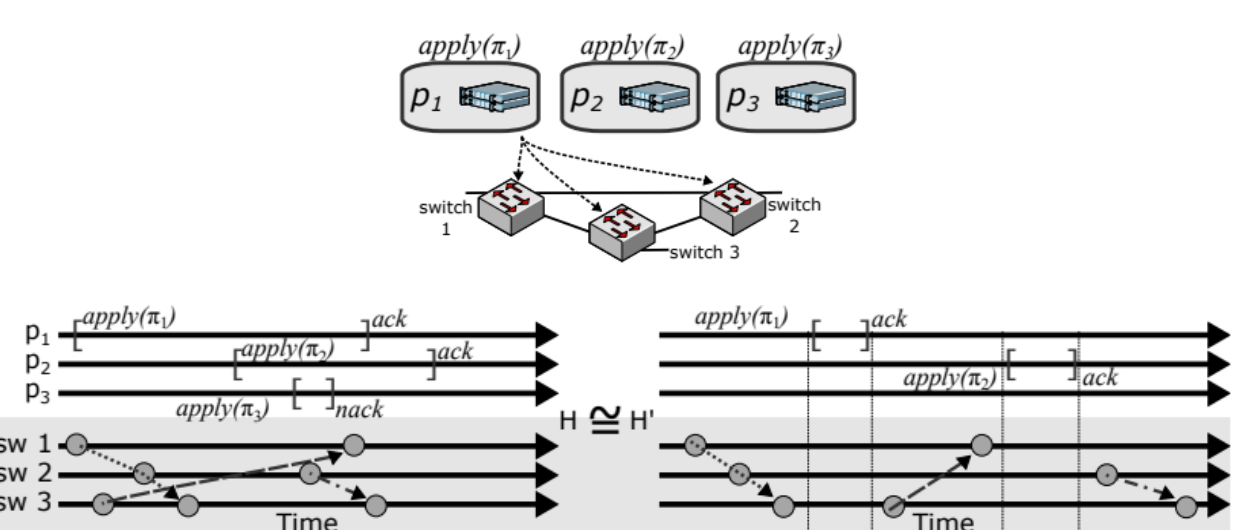

Self-Stabilizing Inband Control
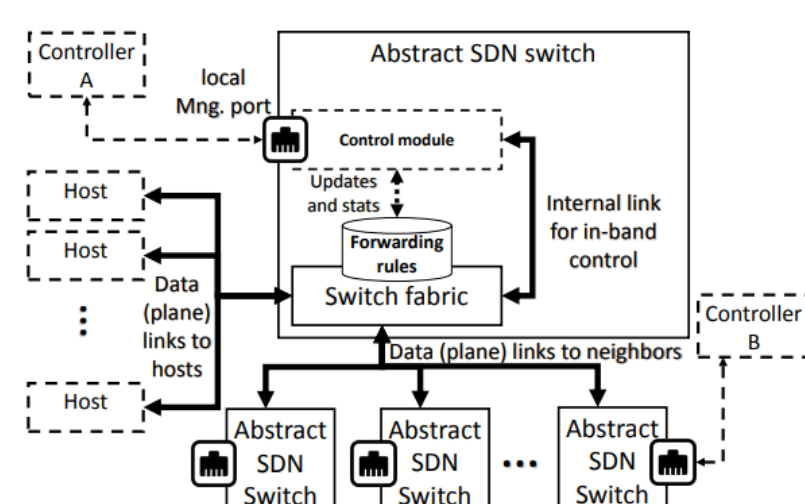
Further Reading

A Distributed and Robust SDN Control Plane for Transactional Network Updates Marco Canini, Petr Kuznetsov, Dan Levin, and Stefan Schmid. IEEE **INFOCOM** 2015.

In-Band Synchronization for Distributed SDN Control Planes Liron Schiff, Petr Kuznetsov, and Stefan Schmid. ACM SIGCOMM CCR 2016.

Renaissance: A Self-Stabilizing Distributed SDN Control Plane Marco Canini, Iosif Salem, Liron Schiff, Elad Michael Schiller, and Stefan Schmid. IEEE **ICDCS** 2018.
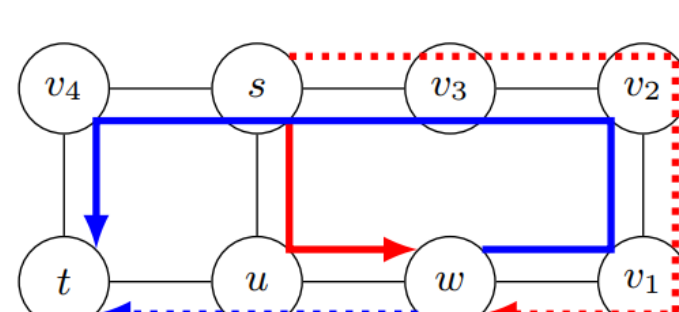
SDN Updates

E.g., Policy-Compliant Network Updates
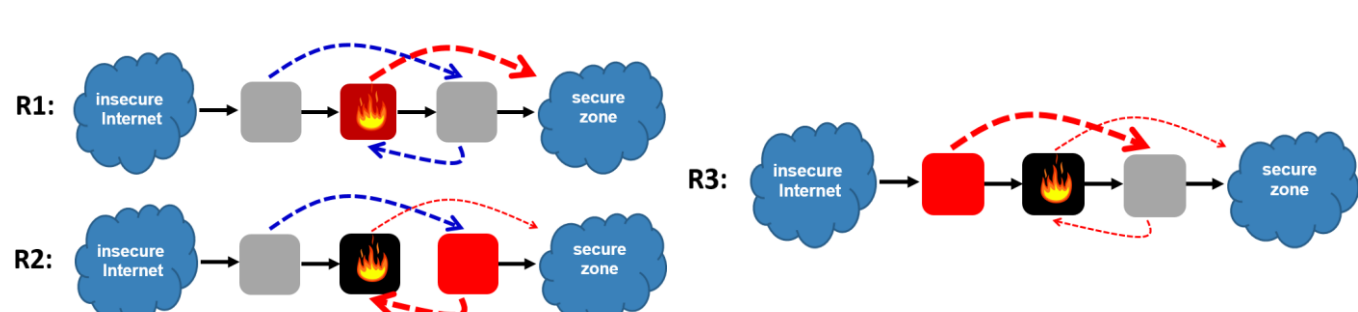
Survey of Consistent Network Updates
Klaus-Tycho Foerster, Stefan Schmid, and Stefano Vissicchio. ArXiv Technical Report, September 2016..
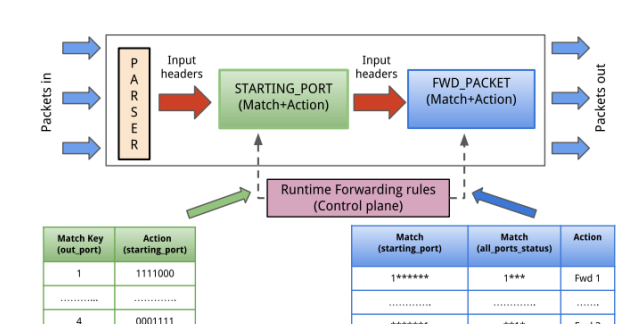
Waypoint TE and VNEP

Hard but how hard?

Charting the Algorithmic Complexity of Waypoint Routing
Saeed Akhoondian Amiri, Klaus-Tycho Foerster, Riko Jacob, and Stefan Schmid. ACM SIGCOMM Computer Communication Review (**CCR**), 2018.

Fast Rerouting

E.g., in P4

Supporting Emerging Applications With Low-Latency Failover in P4
Roshan Sedar, Michael Borokhovich, Marco Chiesa, Gianni Antichi, and Stefan Schmid. ACM SIGCOMM **NEAT** 2018.